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## G172 – THE FOURTH HORIZONTAL BRANCH VARIABLE STAR BLUEWARD OF THE RR LYRAE GAP IN M4

G172 (Greenstein 1939)=A522 (Alcaino 1975)=L1717 (Lee 1977) is a horizontal branch star blueward of the RR Lyrae instability strip in the globular cluster M4 (see Figure 1). The proper motion study (Cudworth 1990) shows G172 is a cluster member (Pc=0.99). The magnitudes and colors given by different authors are:

| V= | 13.17 | B−V= | 0.35 | (Alcaino 1975) |
|----|-------|------|------|----------------|
|    | 13.14 |      | 0.56 | (Lee 1977) |
|    | 13.29 |      | 0.52 | (Cudworth 1990) |

The projection distance of the star from the center of the cluster is 38″. In Table 3 of his paper, Lee (1977) gave the note "V" for L1717 and pointed out that it is a new RR Lyrae variable star not listed in Sawyer-Hogg's catalogue. Lee did not determine the period of the star.

We found the variablility of G172 independently in 1976. We thought that it was an RRc variable star at first. After measuring several hundreds of photographic plates, we realized that it is not an RRc star because the amplitude of the star never exceeds 0.1 mag. in B and the period is shorter than 0.3 day if exists. Due to the low accuracy of photographic photometry we could not determine the period of the star.

Thanks to the use of the CCD camera, preliminary periods have now been obtained. The observations were made with the RCA CCD #1 attached to the Cassegrain focus of the 1-m Zeiss reflector at the Yunnan Observatory on 1992 May 6. The detector contains 320×512 pixels (pixel size 30×30μm) at a scale of about 0″.47/pixel, thus covering a ∼2′.5×4′ field. A series of 270 second exposures taken in rapid succession over a time interval of about 5ʰ.7 were obtained (59 yellow, 2 blue). The seeing was between 2″.0 and 3″.3 (FWHM). The data were reduced at the Zo-Se section of the United Laboratory for Optical Astronomy with the Sun 4/65 workstation. The DAOPHOT (Stetson 1987) in IRAF was used to reduce the data. The red star G248 (V=12.18, B−V=1.38) was used as the comparison star. Comparing with the other stars in the frame, it is shown that the constancy of G248 is better than ±0.006 mag. The differential extinction between G248 and G172 has been corrected approximately. Breger's (1991) program PERIOD was used to determine the periods. The results so obtained are:

$$m(t) = m_0 + \sum_{i=1}^{2} a_i sin(2\pi t/P_i + 2\pi\varphi_i)$$

Here $P_1$ =0ᵈ.0753,    $a_1$ =0.00894,    $\varphi_1$ =0.7720,
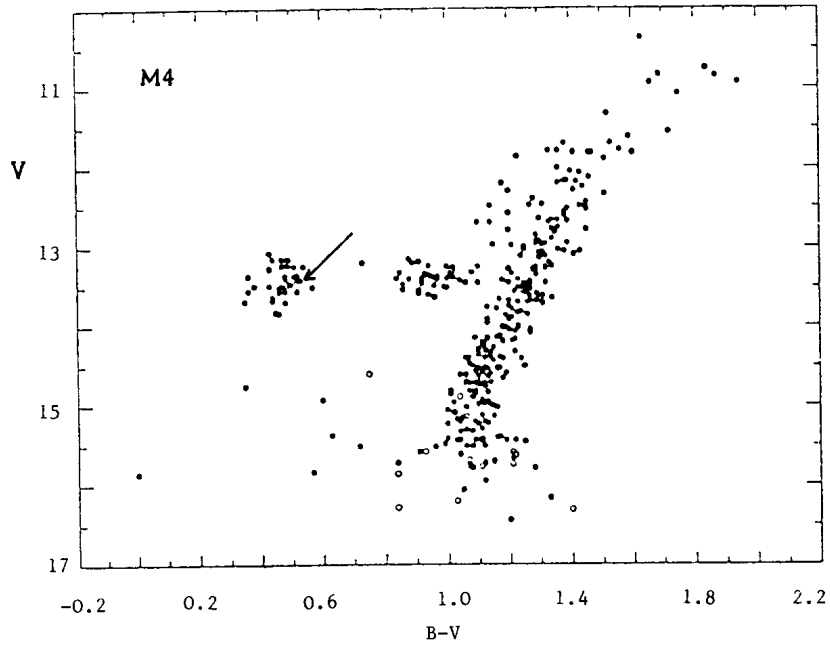$P_2$ =0.2117,    $a_2$ =0.00844,    $\varphi_2$ =0.2059,
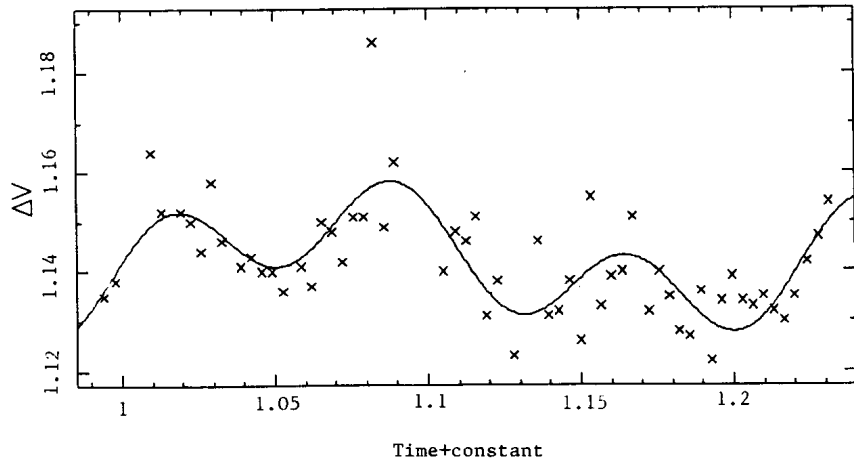$m_0$ =1.142

Figure 1

G 172-G 248



Time+constant

Figure 2

3
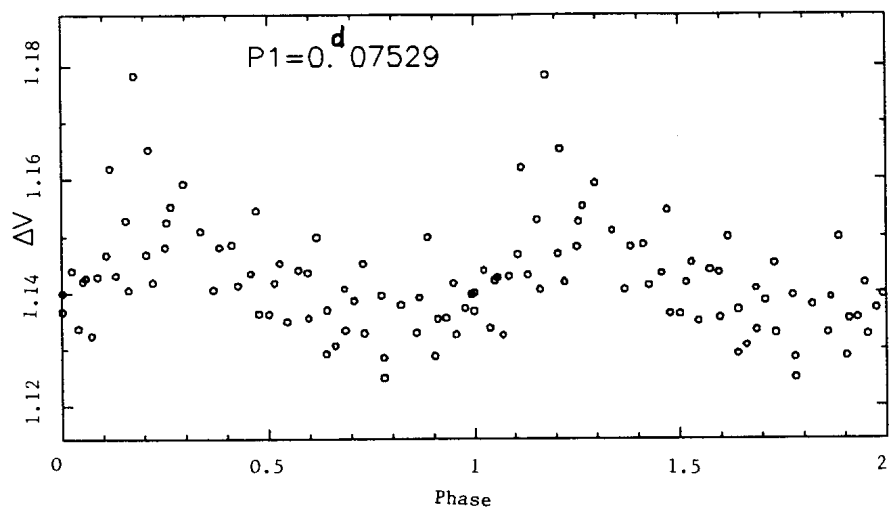
G 172-G 248

P1=0.$^{d}$07529
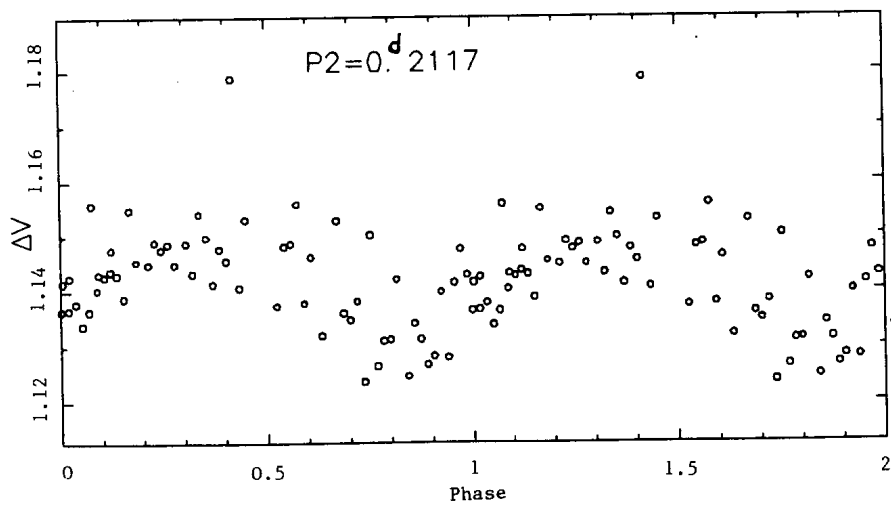


Figure 3

G 172-G 248

P2=0.$^{d}$2117



Figure 4

4

The "real time" light curve is shown in Figure 2 where the curve is calculated with the formula above. The folded light curves are given in Figures 3 and 4. Each light curve is plotted with the data prewhitened with the other frequency.

G172 is the fourth horizontal branch variable star in M4 which is located blueward of the RR Lyrae gap and checked with the CCD photometry by us.

Obviously, the periods given here are only preliminary, further observations are needed to determine the periods accurately.

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References:

Alcaino, G., 1975, *Astron. & Astrophys. Supp.*, **21**, 1
Breger, M., 1991, Delta Scuti Star Newsletter, issue 3
Cudworth, K. M., 1990, *A.J.*, **99**, 1491
Greenstein, J. L., 1939, *Ap.J.*, **90**, 387
Lee, S. W., 1977, *Astron. & Astrophys.*, **27**, 367
Stetson, P. B., 1987, *P.A.S.P.*, **99**, 191